Role Perceptions of Science Academics Who Teach to First-Year Students: The Influence of Gender

MELANIE JACOBS AND GERRIE J JACOBS

University of Johannesburg, South Africa

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Abstract

A marked increase in student enrolments in South African public universities over the last two decades have admitted substantially more 'non-traditional' students to the sector. These students typically have unsatisfactory levels of school performance, lack communication skills (especially in English) and mostly have first-generation status.

The Faculty of Science at the University of Johannesburg established its First Year Academy (FYA) in 2007. The FYA, a community of practice for first-year lecturers, promotes an optimal learning environment for students, and expects lecturers to adjust their usual facilitation of learning strategies. Not much is known (research-wise) about role adaptions that academics (in science environments) are expected (forced?) to make in such circumstances. However, appropriate behaviours and expected competencies have to be interrogated if the faculty wants to continually enhance academic student success.

A literature-validated Likert-type questionnaire involved 53 first-year lecturers (60% females). The survey gained perceptions in respect of eight possible roles that lecturers (could or should) play when dealing with first-year students, as well as their competence in fulfilling these roles. The Mann-Whitney *U* test revealed significant differences between perceived role importance and competence of males and females in respect of certain roles.

Gender was found to significantly influence opinions and behaviours of science academics who teach to first-year students at University of Johannesburg (UJ). Capacity building geared at the more proficient execution of the roles of *course designer*, *teacher*, *course manager* and *student consultant* is regarded as vital and a tailor-made professional development program is planned for 2014.

Keywords: First-year teaching; faculty role competency; science faculty roles; gender in science teaching; First-Year Experience (FYE)

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Correspondence to: Prof. Gerrie J Jacobs, Department of Science & Technology Education (SciTechEd), Faculty of Education, Auckland Park Kingsway Campus, University of Johannesburg, PO Box 524, Auckland Park, Johannesburg, 2006. E-mail: gjacobs@uj.ac.za

Purpose and context of the research

The purpose of this study was to interrogate perceived role importance and competency of lecturers in a Faculty of Science at the University of Johannesburg (UJ), who engaged with first-year students in a post-apartheid South Africa. Since the 1990s, South African's public higher education (HE) sector has converted from catering for a near elite towards a mass system. Enrolments increased from 495,356 in 1994 to 937,455 by 2012 (Republic of South Africa, 2012, p. 37). More non-traditional students (Giancola, Munz, & Trares, 2008), gained access to HE, but often had insufficient prior educational experience, unsatisfactory school performance, a lack of communication skills (especially in English) or a first-generation status (Cavote & Kopera-Frye, 2007; Olive & Russ, 2010).

Various approaches targeting student transition to HE are implemented, with so-called First Year Experience (FYE) programs generating substantial dividends. In South Africa, Stellenbosch University introduced their First Year Academy (FYA) in 2007 (Leibowitz, Van der Merwe & Van Schalkwyk, 2009, p. 3) and the University of Johannesburg (UJ, 2009, p. 4), approved its FYE program in 2009. The latter program posits ten principles, of which the following two are noteworthy:

- It is incumbent on the university to ensure that students are provided with enabling learning environments.
- The challenge of first-year teaching requires special expertise from the academic staff, who must in turn be assisted in meeting these challenges.

The UJ's Faculty of Science established their FYA in 2007 and it serves as a community of practice for lecturers of first-year students, promoting Boyer's Scholarship of Teaching (Boyer, 1997). Much has been written about student transition to HE (Bowles, Dobson, Fisher & McPhail, 2011; Kift, 2009; and others), but according to Corkill, Elkington and Lawrence (2011, p. 118) "…far less is known about the *transitional experiences of academic staff* [emphasis added] who themselves support transitional students".

The faculty's FYA researches strategies and roles of lecturers in dealing effectively with first-year students (UJ, 2013). Adaptions to academics' customary roles are recommended and appropriate lecturer behaviour and competencies have to be developed in enhancing the academic success of these students.

Literature perspectives

As background, two complementary sets of literature perspectives are considered as relevant. The interrogation of some strategies that HE institutions implement in dealing with first-year students is followed by a brief outline of expected (and changing) roles and competencies of lecturers who teach to first years.

Strategies in dealing with first-year students

The scholarly dialogue on the transition of students to HE has been well-established internationally since the 1970s (Akerlind, 2005, p. 1) and actively pursued in South African universities over the last decade. The following strategies, internationally and nationally, seem to generate success in this domain:

- Specialised FYE centres: Dedicated FYE centres that ease student transition into university curricula and standards are common in the USA such as the Division of Academic Enhancement (University of Georgia, n.d.) and they are also increasing in European, Asian, UK and Australian HEs (Meyers & Ryan, 2008).
- Formalised student orientation programs: Universities offer formalised orientation (induction) programmes for transitional students (Kift, 2008). UJ's Faculty of Science offers a comprehensive "First Year Seminar" (UJ, 2013) as a credit-bearing module that develops students' laboratory, computer skills, language and mathematical proficiency before the academic year starts.
- Support programs and structures: Kift (2008, p. 16) warns that "…few assumptions can be made about students' entering knowledge, skills and attitudes." Transitional attempts include the scaffolding of academic skills (Grayson, 1997) and South African students need more support to meet the multilingual and diversity challenges, more learning and writing centres, tutoring and mentoring programs (Bowles, et al., 2011 p. 69).
- Specialised curriculum design: Foundational modules characterise curriculum alignment efforts in South Africa (Hay & Marais, 2004). UJ's Faculty of Science (Jacobs, 2010) offers a generic first semester of fundamental science modules, articulating to science and engineering programs.

The aforementioned strategies strongly rely on lecturers' ability to proactively recognise and adapt their traditional roles and behaviours so that they can to better support the growing number of non-traditional students. Envisaged lecturer roles and competencies are the focus of the next set of literature perspectives.

Roles and competencies of lecturers

- Generic lecturer roles and competencies: Lentell (2003) regards effective lecturers as knowledge experts, listeners, communicators, coaches, learning facilitators, mentors, problem-solvers, designers, supporters and resource coordinators. Cornelius and Higgison (2000) summarise 11 literature-supported roles and Briggs (2005), through probing the behaviours of Scottish academics, generated a so-called "generic role model" applicable to lecturers in all environments. Figure 1 represents the model, incorporating eight so-called "core" and eight "peripheral" roles (Briggs, 2005, p. 264), in the inner and outer circles respectively.

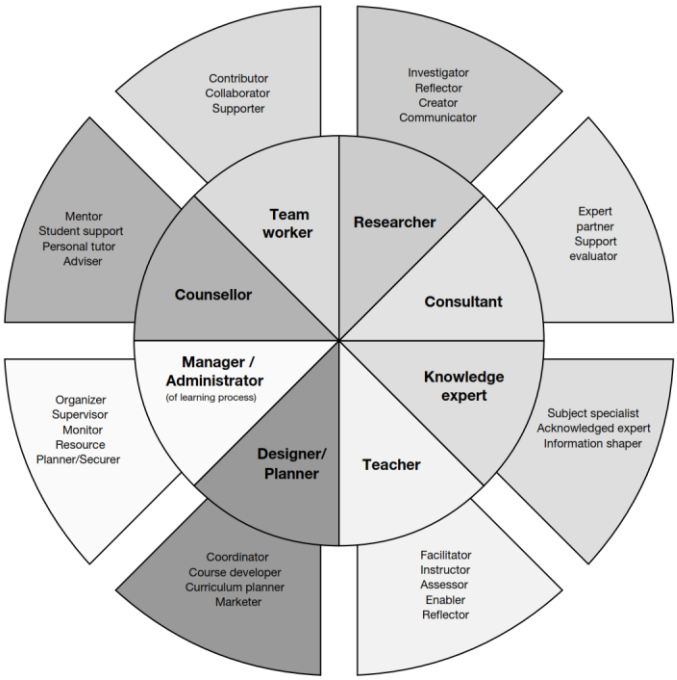

Figure 1. Model of generic lecturer roles.

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The eight core roles are interrelated and comprise the expected repertoire of lecturer behaviours, while the peripheral roles may be less or more prominent, depending on the situation. Briggs (2005) denotes that lecturers regard all eight core roles as important, but perceive several competency gaps in fulfilling these roles.

- Roles of lecturers in dealing with first-year students: Lecturers who deal with (especially present generation) first-year students, are expected to make adaptions to their generic roles, by placing themselves in the student's position (Leibowitz et al., 2009). They have to make students feel that they 'belong' in their courses. These students rely on lecturers to be as enthusiastic and accessible motivators, mentors and advisors, who listen and reward hard work and performance (Leibowitz et al., 2009).
- The influence of gender on lecturing roles, specifically in science faculties: In most school education systems students are taught mainly by female teachers. Science faculties have been male lecturer dominated for centuries (Corkill, et al., 2011) and this is still the case. The Briggs (2005) study highlights that male lecturers prefer to demonstrate their expertise and status through lectures, while females are more comfortable with listening to and counselling students through various teaching and learning methods. Arbuckle and Williams (2003) consider warmth and sympathy as typical feminine characteristics and dynamism and eagerness as more masculine.

Science academics' perceptions of role importance and competency: An empirical investigation

Research methodology

Research approach

The investigation adopted a quantitative approach, based on the assumption that the variables of interest (the perceptions of first-year lecturers in respect of the roles that they play and their competency in fulfilling each role) can be quantified and measured. This approach is therefore post-positivist (Heppner & Heppner, 2004, p. 143), which presumes that an external reality exists independent from the researchers, but that this reality cannot fully be known. From this perspective, the aim of the empirical investigation was to make sense of the complexity of the world in which first-year science lecturers at UJ in operate. The findings should provide guidance for intervention, if necessary, by the faculty's First Year Academy (FYA). The post-positivist approach does not aim to generate theories, models, frameworks, guidelines or programs that reflect absolute truths about the reality of the participants. The outcomes should rather be judged with respect to the usefulness (substantively and practically) of the findings it generates.

Participants

Purposive sampling was used at the end of November 2012 in the Faculty of science's annual FYA seminar when first-year lecturers completed the data collection instrument (next subsection). Individual consent was eventually given by each of the 53 participants, with Table 1 displaying a demographic analysis.

Table 1

Demographic analysis of participants

Variable		***N*=**	**%**
Gender	Female	31	58.49
	Male	22	41.51
	Total	**53**	**100.00**
Ethnic group	Black	17	32.08
	Other	6	11.32
	White	30	56.60
	Total	**53**	**100.00**
Home language	Afrikaans	18	33.96
	English	20	37.73
	Other language	15	28.30
	Total	**53**	**100.00**
Years at UJ (since 2005)	0–5 years	24	47.06
	6 years +	27	52.94
	Total	**51**	**100.00**
Years of HE teaching experience	0–5 years	17	32.69
	6–10 years	15	28.85
	11 years +	20	38.46
	Total	**52**	**100.00**
Years of teaching to first years	0–5 years	17	32.69
	6–10 years	15	28.85
	11 years +	20	38.46
	Total	**52**	**100.00**

The participants can be labelled as mostly *female* (59%), either *Black* (more than a third) or *White* (more than half), commonly *English*- or *Afrikaans*-speaking (these two groups made up 72% of the participants), *relatively experienced* (two thirds having more than five years' experience of teaching to first years) first-year science lecturers.

Data collection instrument

A literature-validated structured questionnaire, based on Briggs's version (2005), was used to collect information from the participants. The goal was to gain lecturers' perceptions on the importance of roles that they play in dealing with first-year students and the extent to which they regarded themselves as competent (or less able) to fulfil these roles, using the eight core roles described by Briggs (2005, p. 264). Respondents were requested to indicate the perceived extent of importance of each role, as well as their competencies in fulfilling these roles on a 5-point Likert-type scale, from **1** (*not important* or *competent*) through **3** (*moderately important* or *competent*) to **5** (*very important* or *competent*). The main duties and responsibilities associated with each role were outlined (compare Table 2) to lessen potential role uncertainty.

Table 2

Description of the typical duties and responsibilities associated with the eight lecturer roles

Lecturer roles	Main role duties and responsibilities
Manager	Organiser, Supervisor, Resource planner
Team worker	Contributor, Collaborator, Supporter
Course designer	Curriculum designer, Course developer, Curriculum reviewer
Knowledge expert	Disciplinary expert/specialist, Information shaper
Researcher	Investigator, Creator, Scientific communicator
Teacher	Lecturer, Facilitator of learning, Assessor of learning
Consultant	Supporting peer for other colleagues, Expert partner
Counsellor (Advisor)	Student mentor, advisor or tutor

Empirical findings

Gender-specific views on role importance

The ratings of females compared to males in respect of the perceived importance of each of the eight roles are indicated in Table 3. The table portrays the combined number and percentage of males and females, who respectively selected 'higher' importance ratings per role—a **4** (*important*) or a **5** (*very important*).

Table 3

Gender differences in respect of role importance

Roles	Females			Males			All		
	***n* (of *N*)**	**%**	**Mean**	***n* (of *N*)**	**%**	**Mean**	***n* (of *N*)**	**%**	**Mean**
Manager	25 (of 31)	80.6	4.36	16 (22)	72.7	4.05	41 (53)	77.4	4.23
Team worker	22 (30)	73.3	4.13	15 (20)	75.0	3.90	37 (50)	74.0	4.04
Course designer	27 (31)	87.1	4.52	16 (22)	72.7	3.86	43 (53)	81.1	4.25
Knowledge expert	28 (31)	90.3	4.42	18 (21)	85.7	4.38	46 (52)	88.5	4.40
Researcher	21 (31)	67.7	4.03	17 (21)	81.0	4.10	38 (52)	73.1	4.06
Teacher	28 (31)	90.3	4.55	20 (22)	90.9	4.59	48 (53)	90.6	4.57
Consultant	19 (29)	65.5	4.00	16 (22)	72.7	3.91	35 (51)	68.6	3.96
Counsellor	28 (31)	90.3	4.32	16 (22)	72.7	3.96	44 (53)	83.0	4.17

All eight roles were generally regarded as important to very important. The roles of *teachers* (who facilitate learning and application of knowledge) and *knowledge experts* (who possess sufficient relevant knowledge that they share) were judged as important. The role of *consultants* (who act as supporting peers for their colleagues) was rated by the least number of participants as important. With just more than two thirds of participants who rated the *consultant* role as important to very important, compared to almost 90% who held a corresponding view of the *teacher* and *knowledge expert* roles, the finding of Corkill et al. (2011) in respect of science academics was confirmed.

The mean importance ratings of females were 4 and higher for all roles, while males were a little more 'conservative', although differences (with the exception of the roles of *course designer* and *counsellor*) were almost negligible. Both genders regarded their roles as *teachers* as pertinent, with the role of *course designer* (acting as curriculum designer and reviewer) second in importance for females, while the *knowledge expert* role occupied the corresponding place for males. Females also valued the importance of the *knowledge expert* role, while males surprisingly rated their role as *course designers* as the least important.

Testing for significant differences in gender-specific perceptions of role importance

The non-parametric statistical technique, the Mann-Whitney *U* test was used to analyse differences between the medians of the responses for females and males respectively. The reasons why this statistical technique was considered appropriate are that the response values (ratings) do not follow the normal or t-distribution, they are measurable on an ordinal scale and comparable in size. Other assumptions underlying the test that were also taken into account are the coincidence of the sample and the independence of observations, which implies that data referring to one subject cannot affect the data of others (Milenković, 2011, p. 74). Tables 4 and 5 present the *test statistics* and *ranks* for role **importance** (with gender as grouping variable) in respect of all eight roles.

Table 4

Test statistics in respect of role importance

	Manager	Team worker	Course designer	Knowledge expert	Researcher	Teacher	Consultant	Counsellor
Mann-Whitney U	260.500	245.000	209.000	320.500	303.000	334.000	304.500	260.500
Wilcoxon W	513.500	455.000	462.000	551.500	799.000	587.000	557.500	513.500
Z	-1.568	-1.154	-2.591	-.104	-.444	-.157	-.292	-1.572
Asymp. Sig. (2-tailed)	.117	.248	.010	.917	.657	.876	.770	.116
Exact Sig. (2-tailed)	.119	.245	.010*	.976	.669	.946	.783	.121
Exact Sig. (1-tailed)	.057	.124	.005*	.485	.337	.478	.413	.064

Note. Test statistics = Grouping Variable: Gender ***** = Significant at the 99% level of confidence

Table 5

Ranks in respect of role importance

Role feature: Importance	Gender	*N*=	Mean Rank	Sum of Ranks
Manager (*N* = 53)	Female	31	29.60	917.50
	Male	22	23.34	513.50
Team worker (*N* = 50)	Female	30	27.33	820.00
	Male	20	22.75	455.00
Course designer (*N* = 53)	Female	31	31.26	969.00
	Male	22	21.00	462.00
Knowledge expert (*N* = 52)	Female	31	26.66	826.50
	Male	21	26.26	551.50
Researcher (*N* = 52)	Female	31	25.77	799.00
	Male	21	27.57	579.00
Teacher (*N* = 53)	Female	31	27.23	844.00
	Male	22	26.68	587.00
Consultant (*N* = 51)	Female	29	26.50	768.50
	Male	22	25.34	557.50
Counsellor (*N* = 53)	Female	31	29.60	917.50
	Male	22	23.34	513.50

The Mann-Whitney *U* test (Tables 4 and 5) indicated that female science lecturers (*Mdn* = 5) regarded the fulfilment of the **course designer** role significantly (99% confidence level) more important than their males counterparts (*Mdn* = 4), *U* = 209.0, *p* =.005. Cohen's effect size (*r* =.36) was in the medium to high interval (Milenković, 2011, p. 77), which implies that the finding also has moderate (to high) practical significance.

Gender-specific views on role competence

The ratings of females compared to males on their perceived competence in fulfilling these lecturer roles are indicated in Table 6. The table portrays the combined number and

percentage of males and females, who have respectively selected 'higher' competency ratings per role (a **4** (*competent*) or a **5** (*very competent*)).

Table 6

Gender differences in respect of role competence

Lecturer Roles	Competent and very competent ratings combined								
	Females			Males			All		
	***n* (of *N*)**	**%**	**Mean**	***n* (of *N*)**	**%**	**Mean**	***n* (of *N*)**	**%**	**Mean**
Manager	23 (30)	76.7	4.10	10 (22)	45.5	3.46	33 (52)	63.5	3.83
Team worker	25 (30)	83.3	4.07	15 (20)	75.0	3.85	40 (50)	80.0	3.98
Course designer	24 (30)	80.0	4.17	14 (22)	63.6	3.73	38 (52)	73.1	3.98
Knowledge expert	24 (30)	80.0	4.17	17 (21)	81.0	4.05	41 (51)	80.4	4.12
Researcher	14 (30)	46.7	3.67	14 (21)	66.7	3.71	28 (51)	54.9	3.69
Teacher	28 (30)	93.3	4.50	15 (22)	68.2	4.05	43 (52)	82.7	4.31
Consultant	23 (28)	82.1	4.11	10 (22)	45.5	3.55	33 (50)	66.0	3.86
Counsellor	25 (30)	83.3	4.17	14 (22)	63.3	3.82	39 (52)	75.0	4.02

To a large extent, participants regarded themselves as competent to very competent in fulfilling the eight roles. Their competence in accomplishing the roles of *teacher, knowledge expert* and *counsellor* (acting as a student tutor, advisor and mentor) were more favourably judged. Their perceived ability as *researchers* (investigating and communicating research findings), *manager* (organising, conducting supervision and planning resources) and *consultant* (supporting peers and others) were rated lower. Just more than half of the participants regarded themselves a competent researchers, which might point to a professional development need.

The mean competency ratings of females were 4 or higher for seven of the roles, with their perceived *researcher* competence a not an unexpected exception. Less than half of the females considered their research ability as competent. Males were a little less self-assured in the rating of their competencies; with a mean score of 4 or higher attained for the *teacher* and *knowledge expert* roles. Their competencies in the execution of the *manager, consultant, researcher* and *course designer* roles were judged to be marginally lower. Less than half of the males considered themselves as competent *managers* and *consultant*s, highlighting a capacity building challenge for the FYA.

Testing for significant differences in gender-specific perceptions of role competency

The Mann-Whitney U test was also used to analyse differences between the medians of female and male responses for role **competency**. Tables 7 and 8 present the *test statistics* and *ranks*, with gender as grouping variable.

Table 7

Test statistics in respect of role competency

	Manager	Team worker	Course designer	Knowledge expert	Researcher	Teacher	Consultant	Counsellor
Mann-Whitney U	205.500	232.500	244.000	287.500	295.000	231.500	188.000	268.000
Wilcoxon W	458.500	442.500	497.000	518.000	760.000	484.500	441.000	521.000
Z	-2.416	-1.487	-1.704	-.578	-.399	-1.988	-2.492	-1.219
Asymp. Sig. (2-tailed)	.016*	.137	.088	.564	.690	.047*	.013*	.223
Exact Sig. (2-tailed)	.017*	.139	.101	.607	.693	.044*	.011*	.236
Exact Sig. (1-tailed)	.008**	.076	.047*	.297	.341	.026*	.006**	.116

Note. Test statistics [=] Grouping variable: Gender
***** Significant at 95% conf level ****** Significant at 99% conf level

Table 8

Ranks in respect of role competency

Role feature: Competency	Gender	*N*=	Mean Rank	Sum of Ranks
Manager (*N* = 52)	Female	30	30.65	919.50
	Male	22	20.84	458.50
Team worker (*N* = 50)	Female	30	27.75	832.50
	Male	20	22.13	442.50
Course designer (*N* = 52)	Female	30	29.37	881.00
	Male	22	22.59	497.00
Knowledge expert (*N* = 51)	Female	30	26.93	808.00
	Male	21	24.67	518.00
Researcher (*N* = 51)	Female	30	25.33	760.00
	Male	21	26.95	566.00
Teacher (*N* = 52)	Female	30	29.78	893.50
	Male	22	22.02	484.50
Consultant (*N* = 50)	Female	28	29.79	834.00
	Male	22	20.05	441.00
Counsellor (*N* = 52)	Female	30	28.57	857.00
	Male	22	23.68	521.00

Findings indicated that female first-year science lecturers regarded their competencies significantly higher than their male counterparts, in fulfilling the roles of:

- **Manager** (female *Mdn* = 4 vs. male *Mdn* = 3), *U* = 205.5, *p* =.008 (at the 99% level of confidence), *r* =.34 (a finding with moderate to high practical significance)
- **Course designer** (female *Mdn* = 4 vs. male *Mdn* = 4), *U* = 244.0, *p* =.047 (at the 95% level of confidence), *r* =.24 (a finding with low to moderate practical significance)
- **Teacher** (female *Mdn* = 5 vs. male *Mdn* = 4), *U* = 231.5, *p* =.026 (at the 95% level of confidence), *r* =.28 (a finding with low to moderate practical significance)

- **Consultant** (female *Mdn* = 4 vs. male *Mdn* = 3), *U* = 188.0, *p* =.006 (at the 99% level of confidence), *r* =.35 (a finding with moderate to high practical significance).

Empirical synthesis

This empirical investigation generated the following noteworthy findings:

- **Role importance** (whole group): The teacher and knowledge expert roles were judged by most, and the consultant role by least participants as important.
- **Role importance** (females versus males): Both genders attached most importance to their teacher roles, with females considering their course designer role as second in importance, while males attached least importance to it. The difference in gender perceptions of the course designer role was found to be statistically significant at the 99% level of confidence, with a moderate to high level of practical significance.
- **Role competency** (whole group): Their ability to fulfil the teacher, knowledge expert and counsellor roles was judged more favourably than their perceived ability to fulfil the researcher, manager and consultant roles.
- **Role competency** (females versus males): Females perceived their own competencies significantly higher than their male counterparts in fulfilling the roles of *course designer*, *teacher*, *manager* and *consultant* (the former two at the 95% and the latter two at 99% level of confidence, with moderate to high levels of practical significance.)

Conclusion

The self-perceived roles and competencies in fulfilling these roles of science lecturers at the UJ, who teach to first-year students, have been the focus of this article. The Faculty of Science's First Year Academy initiated the research, believing that appropriate lecturer behaviour and expected competencies must be identified and developed if the faculty wants to continually enhance the academic success of its growing number of transitional students. Student transition to HE is an internationally recognised research topic, but relatively little is known about perceptions of academic staff who engage with transitional students, and whose traditional roles are thus also in transition. Lecturer perceptions in fulfilling eight roles were empirically interrogated. Gender was found to significantly influence their views and perceived behaviours. Professional development geared at the more proficient execution of the roles of course designer, teacher, course manager and peer consultant might be an important need of these academics.

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